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Carbon Abundances in the Small Magellanic Cloud Planetary Nebulae

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Abstract.
As an ongoing study of Magellanic Cloud PNe we have obtained UV spectra of 9 PNe in the SMC to measure their carbon abundances. The spectra have been acquired with ACS HRC/PR200L and SBC/PR130L. The ACS prisms give a reasonable resolution in the range of 1200 – 2500 Å to detect the C IV, C III], and C II] nebular emission, essential for chemical studies of the PNe. The carbon abundances of SMC PNe, together with those of the LMC previously determined with STIS spectroscopy, will allow a comparative study of nebular enrichment and provide the basis for comparison with stellar evolution models at various metallicity.

Planetary Nebulae (PNe) in the Magellanic Clouds, with known distances and relatively low interstellar extinction, are free of two major biases that hinder Galactic PNe studies, thus they offer a unique opportunity to study the evolution of low- and intermediate-mass stars.

Recently, the carbon abundances of 24 LMC PNe have been determined with the UV spectra acquired with the HST/STIS. The average carbon abundance in round and elliptical PNe is larger than that of the bipolar PNe, confirming that bipolarity in LMC PNe is tightly correlated with high-mass progenitors (Stanghellini, Shaw, & Gilmore 2005).

Planetary Nebulae in the Magellanic Clouds show similar morphologies as the Galactic PNe: round, elliptical, and bipolar. If we compare PNe in the LMC and the SMC, we note that the fraction of aspherical PNe in the LMC is higher than in the SMC. This suggests that the low-metallicity environment of the SMC discourages shaping bipolar PNe (Stanghellini *et al.* 2003). To study the chemical enrichment in such environments, we have acquired UV spectra of SMC PNe with the HST/ACS. The ACS HRC/PR200L and SBC/PR130L prisms give a reasonable resolution in the range of 1200 – 2500 Å to detect the C IV, C III], and C II] nebular emission. The UV spectra of two PNe are shown in Figure 1.

In addition to these two PNe, we have also obtained spectra for SMP 13, 15, 16, 18, 20, 26, and 28, and SMP 24 and 26 will be observed in June-August. We are currently working on the calibration and extraction of the spectra in order to derive the carbon abundances of these PNe. The central star properties and morphology of these PNe have been previously determined (Villaver, Stanghellini, & Shaw 2004; Stanghellini *et al.* 2003). We will derive the abundance-to-mass relationship, and correlate it with their morphology. This will allow us to probe the cosmic recycling, test the PN luminosity function, and study the stellar population and evolution in a very low-metallicity environment.

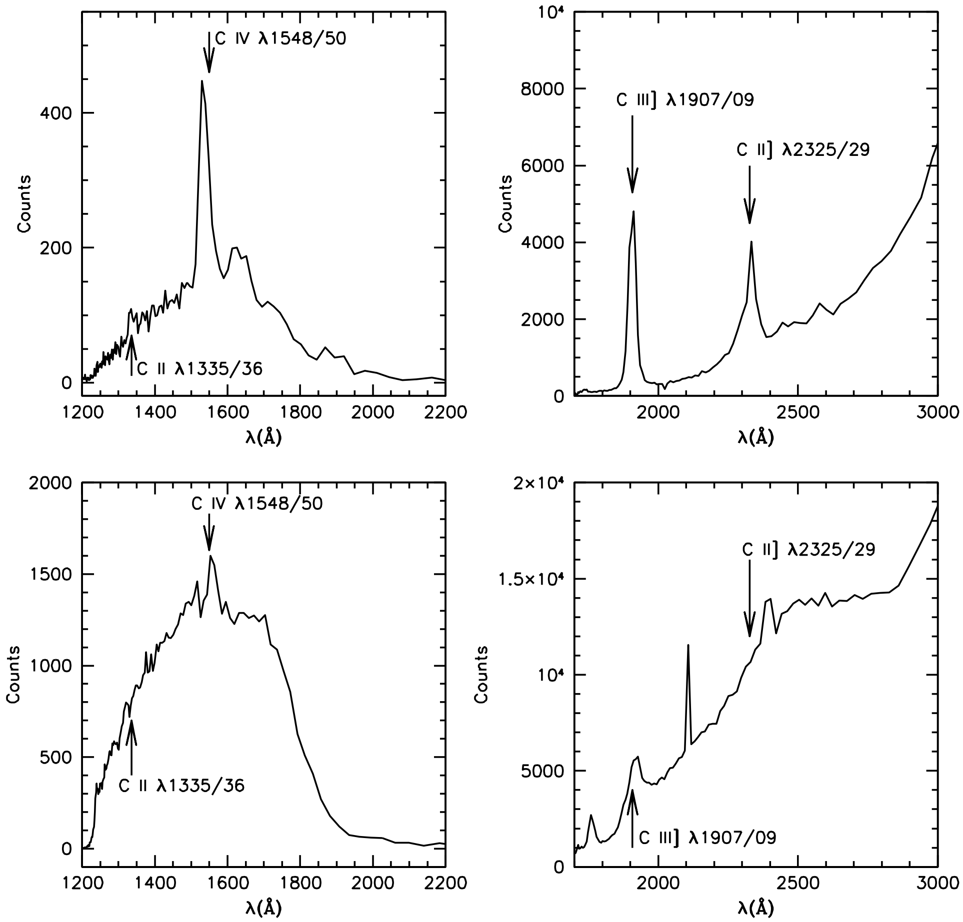

Figure 1. Top: Spectrum of SMP 6 obtained with SBC (left) and HRC (right). Bottom: Spectrum of SMP 8 obtained with SBC (left) and HRC (right). The carbon lines are indicated with arrows.

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